系所組別： 系統及船舶機電工程學系甲乙丙丁組

考試科目： 工程數學

考試日期：0222，節次：3

※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Find the solution of $y''+2y'+y=xe^{-x}$, $y(0)=1$, $y'(0)=-2$. (10%)

2. Find the solution of $x^3y'''+2x^2y''+xy'-y=15\cos(2\ln x)$, $y(1)=2$, $y'(1)=-3$, $y''(1)=0$. (10%)

3. Find the solution of $\begin{aligned} x_1' &= 3x_1 - x_3 \\ x_2' &= -2x_1+2x_2+x_3 \\ x_3' &= 8x_1 - 3x_3 \end{aligned}$, $\mathbf{x}(0)=\begin{bmatrix}-1\\2\\-8\end{bmatrix}$. (15%)

4. Find the Fourier cosine and sine integral representations of the function $f(t)=\begin{cases}1+\cos t & 0\le t\le \pi \\ 0 & \pi \le t<\infty\end{cases}$. (15%)

5. Find the solution of the following equation by applying the method of separation of variables.

$\dfrac{\partial^2 u}{\partial x^2}=\dfrac{\partial u}{\partial t}$, $0\le x\le l$, $0\le t$, $u(0,t)=5$, $u(l,t)=10$, $u(x,0)=10$. (15%)

6. Find the angle between the normals to the surface $xy=z^2$ at the points (1, 4, 2) and (-3, -3, 3). (10%)

7. Find the principal value of $\ln(1-i\sqrt{3})$ in the form $a+ib$, where $i=\sqrt{-1}$. (10%)

8. Evaluate $\int_{-\infty}^{\infty}\dfrac{\sin x}{x^2+4x+5}\,dx$ by applying the method of residues. (15%)